EMULEX®

LPe12000 and LPe12002 HBA

Installation Manual

Last updated January 29, 2008

Introduction

This manual describes the Emulex® LPe12000 and LPe12002, 8 gigabit per second (Gb/s) Fibre Channel (FC) to Peripheral Component Interconnect Express (PCIe) host bus adapters (HBAs). They feature a revolutionary design with integrated ARM-1156 cores, integrated SERDES, integrated SRAM, and external Double-Data Rate (DDRII SRAM) memory structure. The Emulex LPe12000 is a single-channel adapter. The LPe12002 is a dual-channel adapter.

The core technology of these HBAs is the ninth generation FC controller by Emulex. The controller incorporates a multifunction native PCIe core that is compliant to the PCIe Base Specification 2.0 and PCI Express CEM Specification 2.0. The HBAs support packet transfers up to 5 gigatransfers per second (5.0 GT/s) on the PCIe link. The supported physical PCIe connector is x4 or x8. The fully featured FC port is compliant to various American National Standards Institute (ANSI) FC standards. The product is targeted at FC storage networking environments that require the highest degrees of robustness, performance and ease of management.

Major Features

- Multifunction PCIe 2.0 device with one (LPe12000) or two independent FC ports (LPe12002)
- Auto-negotiation between 2-Gb/s, 4-Gb/s or 8-Gb/s FC link attachments
- Complies with the PCIe base and CEM 2.0 specifications:
- Built-in temperature sensor

Compatibility

Table 1. Software and Hardware Environments

Software Environments	Windows Server 2003, Windows Server 2008, Windows Vista, Sun Solaris and Linux
Hardware Environments	PCIe 2.0 and CEM 2.0 compliant systems and backwards compatible to 1.0a and 1.1 compliant systems.

Prerequisites

- PCIe 2.0 compliant systems: x4 or x8 lane transfer link interface:
- 3.3 V and 12 V power from PCIe slot required for operation

Setting the Jumpers

Caution: Emulex LightPulse® HBAs contain electronic components that can be damaged by static electricity through an electrostatic discharge (ESD) event. To prevent ESD damage, maintain constant contact with any grounded metal surface. A grounding wrist strap is useful for this purpose. Handle the card carefully at all times and preferably by the edges. Avoid touching electronic components and keep the card in the original packaging until you are ready for installation.

The device ID jumpers are used in custom applications. Do not change the jumper settings for a standard Emulex installation.

The LPe12000 HBA has one six-post jumper block that controls the HBA's device ID. The LPe12002 HBA has two six-post jumper blocks that control the HBA's device ID for Ports 0 and 1. Select the ID by installing a jumper between posts 1 and 2, or 3 and 4, or 5 and 6. If no jumper is installed, the default device ID is 0x1AE5.

Table 1. Jumper Settings (Port 0 on the LPe12000 - Ports 0 and 1 on the LPe12002)

PCI Identifier	P0_JX (Port 0)	P1_JX (Port 1)
F100	1–2	1–2
F101	3–4	3–4
1AE5*	5–6	5–6

Note: * Without a jumper, the HBA reports a device ID of 0x1AE5. Most software drivers require a PCI device ID of F100 to properly identify and control the HBA. Do not attempt to operate the HBA with the PCI device ID set to 0x1AE5 unless recommended by the driver installation instructions.
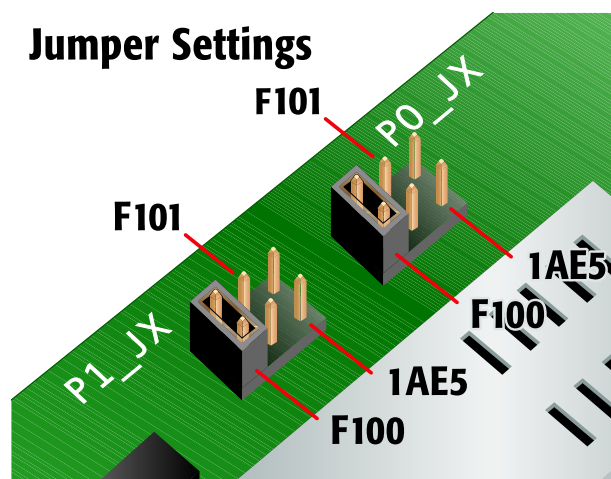

Figure 1: The LPe12000 and LPe12002 Jumper Settings

Installing the Host Bus Adapter

The Emulex LPe12000 and LPe12002 host bus adapters (HBAs) use a removable optical transceiver. If you need to change the bracket for HBA installation, you must first remove this transceiver from its housing (cage). This document explains how to install the HBA and, if necessary, how to remove the transceiver and bracket safely. To install the HBA:

1. Each HBA is shipped with several numbers clearly marked on the board. these include

   • IEEE Address

   • World Wide Name (WWN)

   • Serial number

   The IEEE address is a unique 64-bit identifier that you use when configuring your system. The FC industry uses the World Wide Name (WWN) derived from the IEEE address for FC connectivity. If the adapter has two ports, there are two IEEE addresses and two WWNs. Use the serial number when communicating with Emulex. Record these numbers before installation.

2. Turn off the computer and unplug it.

3. Remove the computer case.

4. Follow steps 5–12 to change the bracket if they are different sizes. Otherwise, skip to step 13.

   > **Note:** The HBA comes with a standard PCIe bracket installed. A low-profile bracket is included in the box with the HBA. The low-profile mounting bracket is shorter than the standard bracket; approximately 3.11 in. (7.9 cm) compared to 4.75 in. (12.06 cm) long.

5. To change the bracket, you must first remove the transceiver from its cage assembly.

CAUTION: This is a delicate operation–take care not to damage the transceiver.

The HBA uses different types of transceivers. Figure 2 shows an example of one type showing the bail (handle) extended.
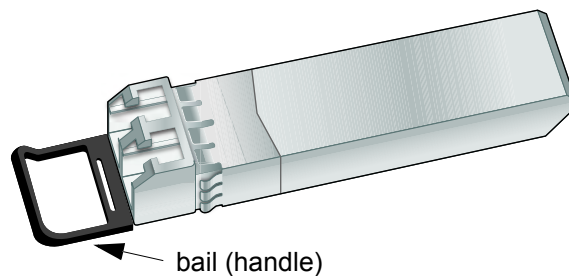

bail (handle)

Figure 2: Example of a transceiver

6. To remove the transceiver, pull the bail (handle) out and down to release the latch and gently pull the transceiver out. Do not force it. After the latch is released, the transceiver slides out easily.

Figure 3 shows one transceiver partly extracted and the other latched in place
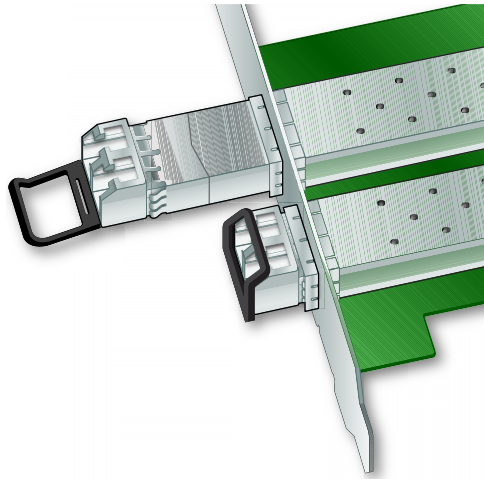
Figure 3: Removing a transceiver

7. Observing ESD precautions, store the transceiver in an ESD-safe place.
8. Remove the mounting bracket screws from the top of the HBA.
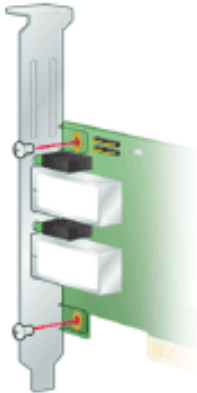
Figure 4: Removing the Bracket

9. Remove the bracket and store it for future use.
10. Align the new mounting bracket tabs with the holes in the HBA.

> **Note:** Be careful not to push the bracket past the transceiver housing's grounding tabs. Make sure the light emitting diodes (LEDs) are properly aligned with the holes in the bracket.

11. Re-install the screws that attach the HBA to the bracket.
12. Re-install the transceiver by sliding it into the housing. When the latch engages, it clicks.
13. Push the bail back into place.
14. Remove the blank panel from an empty x8 or higher PCIe bus slot.
15. Insert the HBA into the empty slot. Press firmly until the adapter is seated.
16. Secure the HBA's mounting bracket to the case with the panel screw or clip.
17. Replace the computer case and tighten case screws.

The HBA is now installed in the PC and is ready for media attachment.

Attaching Media

Note: The HBA will not allow normal data transmission on an optical link unless it is connected to another similar or compatible laser product (that is, multimode to multimode.)

Note: The HBA will not automatically downgrade to the required FC speed based on cable length. You must downgrade the speed with the appropriate utility or link errors may occur.

Use multimode fiber optic cable, with short-wave lasers, that adheres to the following specifications:

Table 5. Media Specifications

Fiber Optic Cable	Maximum Length	Minimum Length	Connector
OM3 - Multimode 50/125 micron fiber (2000 MHz*km bandwidth cable)	2.125Gbps: 0.5m - 500m 4.25Gbps: 0.5m - 380m 8.5Gb/s 0.5m – 150m	.5 meters	LC
OM2 - Multimode 50/125 micron fiber (500 MHz*km bandwidth cable)	2.125Gb/s: 0.5m – 300m 4.25Gb/s: 0.5m – 150m 8.5Gb/s 0.5m – 50m	.5 meters	LC
OM1 - Multimode 62.5/125 micron fiber (200 MHz*km bandwidth cable)	2.125Gb/s: 0.5m – 150m 4.25Gb/s: 0.5m – 70m 8.5Gb/s 0.5m – 21m	.5 meters	LC

To attach media to the HBA:

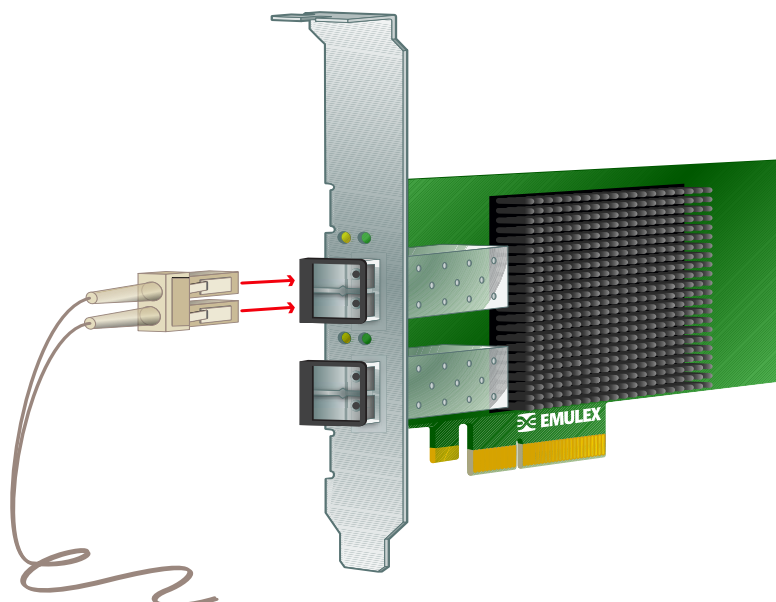1. Connect a fiber optic cable to an LC connector on the HBA. See figure 6.

Figure 6: Connecting Fiber Optic Cable

2. Connect the other end of the cable to the Fibre Channel device.

After the media is connected to the HBA, you are ready to apply power to the computer.

Applying Power

To apply power:

1. Verify that the HBA is securely installed in the computer.
2. Verify that the correct media is attached.
3. Plug in the computer and turn it on.
4. Watch the LEDs for Power On Self Test (POST) results.

Viewing the LEDs

You can see green and yellow LEDs through openings in the HBA's mounting bracket. The green LED means firmware operation and the yellow LED means port activity. Each port has a corresponding set of green and yellow LEDs.
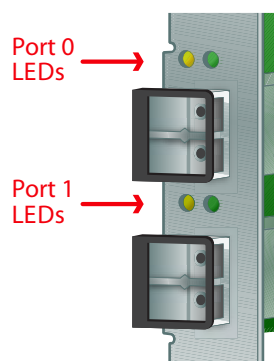
Figure 7: LEDs

POST Conditions and Results

The following table summarizes POST conditions and results:

Note: For the Link Rate conditions, there is a 1 second pause when the LED is off between each group of fast blinks (2, 3 or 4). Observe the LED sequence for several seconds to be sure you have correctly identified the pattern.

Table 8. POST Conditions and Results

Yellow LED	Green LED	State
Off	Off	Wake-up failure (Dead board)
On	Off	POST failure (Dead board)
Slow Blink	Off	Wake-up failure monitor
Fast Blink	Off	POST failure
Flashing	Off	POST processing in progress
Off	On	Failure while functioning
On	On	Failure while functioning
2 Fast Blinks	On	2Gb Link rate-Normal, link up
3 Fast Blinks	On	4Gb Link rate-Normal, link up

Table 8. POST Conditions and Results (Continued)

Yellow LED	Green LED	State
4 Fast Blinks	On	8Gb Link rate-Normal, link up
Off	Slow Blink	Normal-link down or not started
Slow Blink	Slow Blink	Off-line for download
Fast Blink	Slow Blink	Restricted off-line mode (Waiting for restart)
Flashing	Slow Blink	Restricted off-line mode (Test active)

References

Specifications

Table 9. LPe12000 and LPe12002 Specifications

Parameter	Range
Media Interface	The controller interfaces to the physical media through an FC-0 Media Interface (FC-PI compliant transceiver), and then connects through dual optical fiber LC connectors.
Physical Dimensions	Low-profile MD2 form factor, 6.600 inches by 2.713 inches, and accommodates both the full-height and low-profile bracket.
Power Requirements	LPe12000 • 1.1 watts (typical) @ +3.3 V ±9% • 2.0 watts (maximum) @ +3.3 V ±9% • 5.8 watts (typical) @ +12 V ±8% • 8.8 watts (maximum) @ +12 V ±8% • 6.9 watts (typical) total • 10.1 watts (maximum) total LPe12002 • 1.7 watts (typical) @ +3.3 V ±9% • 2.0 watts (maximum) @ +3.3 V ±9% • 7.1 watts (typical) @ +12 V ±8% • 11.3 watts (maximum) @ +12 V ±8% • 8.8 watts (typical) total • 13.3 watts (maximum) total
Airflow	150 lf/min (minimum)
Temperature	32°F-131°F (0°C-55°C), Operating -40°F-158°F (-40°C-70°C), Storage
Humidity	5% to 95% non-condensing

Agency Approvals for LPe12000 and LPe12002	Class 1 Laser Product per DHHS 21CFR (J) & EN60825-1
	UL recognized to UL60950-1
	CUR recognized to CSA 22.2, No. 60950-1-03
	TUV certified by to EN60950-1
	FCC Rules, Part 15, Class A
	Industry Canada, ICES-003, Class A
	EMC Directives 2004/108/EEC (CE Mark)
	  EN55022, Class A
	  EN55024
	Australian EMC Framework (C-Tick Mark)
	  AS/NZS CISPR22:2002 Class A
	Japan VCCI, Class A
	Taiwan BSMI, Class A
	Korea MIC, Class A
	RoHS Compliant (Directive 2002/95/EC)
	China RoHS

FCC and Regulatory Notices

LPe12000 and LPe12002 HBA Models

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:

Jim McCluney, Chief Executive Officer

Emulex Corporation (714) 662-5600

3333 Susan St. Costa Mesa, CA. 92626 USA

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. The reader is cautioned that changes or modifications made to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment. The above statement applies to products marketed in the USA.

This class A digital apparatus meets all requirements of the Industry Canada (IC) Interference - Causing Equipment Standard (ICES-003).

Cet appareil numerique de la Classe A respecte toutes les exigences du reglement sur le materiel brouilleur du Canada. This statement applies to products marketed in Canada.

Notice for Japan and Translations (VCCI)

Product Label

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. VCCI—A

この装置は，クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害をひき起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　　　VCCI－A

Manual Notice

Translation:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

この装置は，情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Notice for Taiwan and Translations (BSMI)

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，
可能會造成射頻干擾，在這種情況下，使用者會
被要求採取某些適當的對策。

Translation:

This equipment is a Class A ITE, and operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

Notice for South Korea and Translations (MIC)

사용자 안내문 (A급 기기)
본 기기는 업무용으로 전자파적합등록을 받은 기기이오니, 만약 잘못 구입하셨을 때에는 구
입한 곳에서 비업무용으로 교환하시기 바랍니다.

Translation:

Class A Equipment: Please note that this equipment has been approved for business purposes with regards to electromagnetic interference. If purchased in error for use in a residential area, you may wish to exchange the equipment where you purchased it.

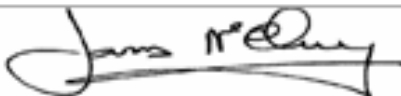# Declaration of Conformity

LPe12000 and LPe12002 HBA

This equipment complies with CISPR22/EN55022 Class A.

WARNING: This is a class A product. In a domestic environment, this product may cause radio interference requiring the user to take adequate measures.

Note: Changes or modifications not expressly approved by Emulex Corporation could void the user's authority to operate this equipment.

DECLARATION OF CONFORMITY

Manufacturer:	Emulex Design and Manufacturing Corporation
	3333 Susan Street
	Costa Mesa, California 92626 USA

declares under sole responsibility that the product:

Product Name:	LightPulse™ Fibre Channel Host Bus Adapter
Models:	LPe12002-xx, LPe12000-xx, LPe1250-xx
Assembly Number:	P002181-xxx (P001219-xxx)

To which this Declaration relates is in conformity with the following standards or other documents for Information Technology Equipment (ITE):

Product Safety:	UL Recognized to UL 60950-1:2003, First Edition
	CUR Recognized to CSA22.2, No. 60950-1-03
	IEC 60950-1 (2001) [CB Scheme]
	EN 60950-1 (2001) + A11
	EN 60825-1 (1994) + A1 +A2
	EN 60825-2 (1994)
	CFR Title 21, Laser AEL Class 1, FDA/CDRH

EMC:	FCC Rules, CFR Title 47, Part 15, Subpart B, Class A
	Industry Canada, ICES-003, Class A
	EN55022 (2006) / CISPR 22 (2005) Class A, EN55024 (1998) +A1 +A2
	AZ/NZS CISPR22 (2006), Class A
	VCCI V-2 / V-3, Class A
	CNS 13438 (2006) Class A, KN22 (2007-69) Class A, KN24(2007-71)

Supplementary Information:	1. The Product was tested in a typical configuration.
	2. The product complies with the requirements of the following directives:
	• European Union Low Voltage Directive 2006/95/EC
	• European Union EMC Directive 2004/108/EC
	• CE-Marking Directive 93/68/EEC (Carries the CE-Mark accordingly)
	• Australian EMC Framework (Carries the C-Tick mark accordingly)

| January 8, 2008 Costa Mesa, CA | |
| | James M. McCluney, President and Chief Executive Officer |

| European Contact: | Emulex Corporation 7 & 8 Forest Court Oaklands Park Fishponds Road Wokingham, Berkshire RG41 2FD, England | Telephone: Fax: | 44-118-977-2929 44-118-977-3237 |

Laser Safety Notice

This laser safety information contains certification and product information covering laser products known as optical small form factor transceivers incorporated in Emulex LightPulse host adapters. The small form factor transceiver is the primary cable connection mechanism for any optical port on the host adapter. This data is not intended to be a replacement for any safety regulations and standards; relevant safety documents should always be consulted if necessary. Contact Emulex Corporation with any questions or concerns about laser safety.

Certification and Classification

The LPe12000 and LPe12002 host adapters may contain one or more examples of a laser product known as a small form factor transceiver. This transceiver provides the physical connection to the optical cable, and its LC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's appropriate PCIe expansion slot.

In the United States, all optical small form factor transceivers sold by Emulex are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR subchapter J. The certification is indicated by a label located on the optical small form factor transceiver.
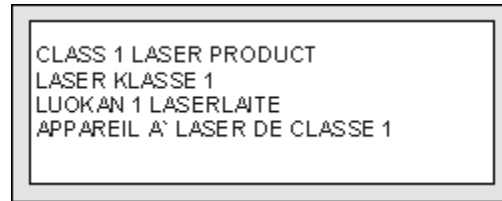
In Europe, all optical small form factor transceivers sold by Emulex are certified as Class 1 laser component assemblies that conform to the requirements contained in the CENELEC (European Committee for Electrotechnical Standardization) standard EN60825-1:1994 (including amendment 11) and EN60825-2:1994. Small form factor transceivers are certified by a recognized European testing agency and have appropriate markings on the assembly. The DHHS conformity label and European conformity mark will not be visible externally once the optical small form factor transceiver is connected to or inserted in the host adapter and the adapter is installed into a system.

Labeling Requirements

No caution or danger labels are required for use of the small form factor transceiver since they are Class 1 laser component assembly. In the U.S., the only laser safety label required is the DHHS certification label that already appears on the small form factor transceiver. In Europe, the EN60825-1/EN60825-2 standards require that the system-level product has a Class 1 information label permanently attached and clearly visible whenever access to the GLM, GBIC, 1x9 and small form factor transceiver optical port is possible. Each Class 1 product shall have affixed an explanatory label bearing the words:

CLASS 1 LASER PRODUCT
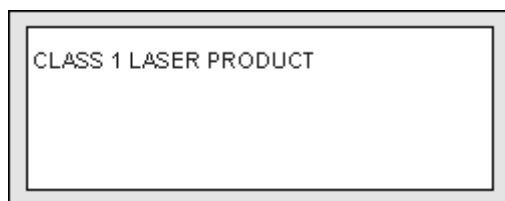
Alternatively, at the discretion of the manufacturer, the same statement may be included in user information. If a label is used, an example of the IEC Class 1 information label that is suitable for most European countries is shown below. The label consists of black printing on a white background. Languages represented on this label are English, German, Finnish and French, and they represent the minimum set for acceptance of a Class 1 product in most European countries.

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CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A` LASER DE CLASSE 1
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Product Information

Small Form Factor Transceiver

The small form factor transceiver is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each small form factor transceiver consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave length small form factor transceivers and 1270 to 1355 nanometers for long wavelength small form factor transceivers. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the small form factor transceiver.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and could possible lead to points of access that may emit laser radiation levels above the Class 1 limits established in the U. S. by the DHHS and within Europe by EN60825-1/EN60825-2.

Short wavelength and long wavelength small form factor transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength small form factor transceivers embedded in Emulex host adapter are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

Any system level product that incorporates the small form factor transceivers must provide power supply protection that guarantees a voltage of 5.0 volts or less at the small form factor transceivers. The functional power supply range of the small form factor transceivers product is specified as 3.135 to 3.465V typically. Operation outside of this range may degrade the performance and lifetime of the transceiver. The transceiver will remain operational with laser emissions below Class 1 limits provided the power supply level at the adapter remains at or below 5.0 volts. If the power supply level rises above 5.0 volts, the small form factor transceiver cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

System Level Certification

All host adapters containing embedded small form factor transceivers are certified as Class 1 laser products within the U.S. and Class 1 laser component assemblies outside of the U.S. Manufacturers of products properly incorporating the small form factor transceiver do not need to recertify their product for laser safety. The procedure for full system certification is therefore identical to that used for any other electronic system. When applying for system level certification to electronic standards such as IEC950, the regulatory engineers may want to see the DHHS and European conformity labeling on the small form

factor transceiver, and the system level documentation and labeling. Copies of the certificate of conformity for any small form factor transceiver sold by Emulex can be obtained upon request from Emulex Corporation, Costa Mesa.